Nest construction technique of the Purple Sunbird

BY

JOSEPH GEORGE

New Forest, Dehra Dun

The nest of the Purple Sunbird (*Nectarinia asiatica*), one of the most wonderful examples of bird architecture, has been described by many ornithologists. Hume (1890) has given the following exhaustive account: 'The nest is pendent, and composed of all kinds of materials beautifully woven together with the silkiest fibres and cobwebs; hair, fine grass, pieces of decayed wood, lichens, rags, thorns, etc., are all pressed into service. The body of the nest is oval, generally, with all sorts of little pendent pieces of wood, etc., hanging below as ornaments, apparently, while the apex of the oval is prolonged into a cone meeting the point of support. A little above the centre of the oval, a small circular aperture is worked, and just above it a projecting cornice, 1 to 1½ inches wide, is extended; then on opposite side of the oval, the wall of the nest, which is ready some days before the eggs are laid, is pushed out or bulged out a little so as to give room for the sitting bird's tail. The bulging out of the back of the nest is one of the last portions of the work, and the female may be seen going in and out trying the fit, over and over again.'

Hutton, a correspondent of Hume (1890), observed that the materials of construction are not interwoven, but held together by cobwebs and seed down sparingly plastered over the other materials, and most abundant at the point of attachment to the twig from which the nest is suspended.

Adam, another correspondent of Hume (1890), found that on the second day after beginning of a new nest, it had the upper portion well formed, on the third day the nest was well blocked out, but had no inner lining, and from the fourth day to the seventh, the bird was occupied in ornamenting the outside of the nest with all sorts of stray feathers and other odds and ends. During these days it also filled in the inner lining. On the ninth day Adam found the bird sitting in the nest, presumably on eggs.

Gill (1924) has briefly described the different stages in the construction of the nest as observed in the plains of U.P. From the point of suspension, he states, the nest is gradually extended and widened till the place where the aperture should be is reached, the nest having acquired by this time the shape of a more or less solid cone with the apex on top. Now comes the aperture with the little projecting cornice above it. Next, the bird extends the body of the nest and finally the soft and cosy egg-compartment. Then follows a short period of activity during which the female may be seen going in and out of the nest, twisting her little body about inside it in order to get the pliable materials to conform to the shape of her body; and, as she sits in the nest with her bill protruding from the aperture, it acquires a distinct bulge behind in order to accommodate her tail in comfort. Gill found that the nest took about 10 days to complete.

Bates has recorded the different stages in the construction of two nests. The first nest (Bates, 1926, 1931) in a Madras garden, the construction of which he saw from its commencement, took a full three weeks to build. On the fifth day the nest had progressed to the extent of being in shape not unlike the upper half of a crinkled paper bag suspended from the branch or a small edition of an unfinished weaver-bird's nest without the cross bar. On the twelfth day this outer shell was almost completed and reminded him of nothing so much as of a deflated penny balloon, the entrance hole appearing like a rent in its side.

The next step appeared to be the construction of the porch, and by the sixteenth day this and the outer shell were altogether finished, even down to the ragged little bits hanging down an inch or so below the nest on loose strands of web. After this no further work was done on the outside. During the next week the 'balloon' was quickly inflated, the bottom presenting a more or less rounded appearance on the afternoon of the seventeenth day.

The second nest, observed by Bates (1927, 1931) in Pachmarhi, was completed within six days. The first day's work resulted in a stalk some 3 inches long which just showed signs of a division in its lower portion from which, Bates thought, the sides were eventually to be formed. On the second day great progress was made, as the entrance and porch were completed and also the sides, front, and half the back, leaving as the third day's task but the bottom and lower half of the back premises to be added. By the afternoon of the third day the female had actually commenced the filling. Three days more and the nest was finished.

The method of construction of the second nest was, according to Bates, virtually the same as that of the first nest he described. The

outside was completed in every detail before the filling and lining was put in hand. The so-called decorations, he remarks, are component parts of the outer case and, far from being additions which might easily be dispensed with, are, or rather those not merely suspended from the structure are, important solid portions—foundations—of the main framework.

Later in the same year, Bates (1931) observed the construction of a nest by the Purplerumped Sunbird (*Nectarinia zeylonica*). The female Sunbird wrapped building materials round a drooping twig causing the loose ends to project on either side of it. These projections were gradually increased, bent round, and brought together, so that the shell was thus formed of two more or less separate halves joined together from below the entrance hole.

If the second Purple Sunbird observed by Bates had adopted such a technique, that is, if it had lengthened the two halves of the stalk and joined them together from below the entrance hole, its method of construction would have been different from that of the first bird which had initially built a small edition of an unfinished weaver-bird's nest without the cross-bar, or in other words, a bell shaped structure.

Lowther (1949) saw a female Purple Sunbird flying from one bush to another one morning prospecting for a nesting site. As soon as a site was decided upon she busied herself with nest building. The following morning Lowther found the bird making 40 visits to the nest in 40.5 minutes and 50 in 60.5 minutes. At 8.15 a.m. the visits to the nest slowed down appreciably and from midday till 2.30 p.m. she did not go near the nest. On the evening of the second day the pendent home was found to have been roughly fashioned, even down to the entrance hole. The nest held the first egg on the sixth day after construction began.

It has been the experience of different observers that the nest of the Purple Sunbird is the work of the female alone. (Sálim Ali, 1955). Lowther (1949) has, however, come across three instances of the male assisting in the task 'at nests each 200 miles apart'. In one case the male bird's contribution was about 25 per cent, in the second about 50 per cent, while in the third only the male proceeded with the construction during the two days following a great fright which the female received as she left the nest.

Hutson (1954) saw 3 female sunbirds at work on their nests. At the time of observation one bird which was reducing the size of the entrance, which was too large, was never at the nest longer than 10 seconds and was often away for over a minute. The second bird was at the nest 5 to 8 seconds at a time and away for 20 to 25 seconds,

while the third one merely stayed long enough to poke in what she had brought before flying back for more.

The writer (1957) had a rare opportunity to observe the construction of a nest by the Purple Sunbird in his bungalow. This was followed by observations on the construction of a few other nests during the nesting seasons of 1957 and 1958 in New Forest, Dehra Dun, U.P. It is possible from these observations to form a complete picture of the operations involved in nest building. It would be interesting to find out, especially in view of Bates's observations, whether the technique followed by the birds in Dehra Dun is the same as that followed elsewhere. Lowther's observations on the participation of male sunbirds in nest construction also show the possibility of variation in nest construction habits.

Method of Nest Construction

The observations in Dehra Dun show that while all the birds followed the same technique of nest construction, there was a certain amount of variation in the timing of the different operations involved, as also in the number of times a particular operation was carried out. Extracts from the field notes on the construction of three nests are given at the end of this paper. These notes show the similarity in technique of construction, and at the same time serve to bring out the differences referred to above.

First day's work: Nest construction always began in the morning. On the morning of the first day, male and female birds together examined different sites and chose one. Prospecting for a nesting site appeared to begin on the day previous to this or even earlier. Bates (1931) found a pair of Purplerumped Sunbirds becoming interested in their nesting site 10 days before construction began. The female Purple Sunbird was often observed to wind cobweb at more than one site before the pair made the final decision about the nesting site. The female, who alone was found to build the nest, alighted on the chosen twig to fix the material she brought. Later on, she alighted on the nest stalk as it took shape. Some material was also fixed while hovering. The female bird was never seen coming to the nest without building material except during the first visit or first few visits in the mornings.

When nest construction began, one bird confused between two sites that were similar in appearance and close to each other on the same twig. Work proceeded simultaneously at the two sites for some time before the bird mastered the situation and built at one site alone. In one instance two strands were built close to each other at a site to

support the nest. When the nest was suspended from a sloping twig, a considerable length of the latter was usually built over. One nest built on an almost vertical stem of a climber was attached to it for a length of about 6 cm. The nest was loosely attached to the stem for a further distance of 12 cm. Bates (1931) found a Purple-rumped Sunbird wrapping building materials to a distance of 5 to 7.5 cm. on a twig drooping at an angle of about 60°. In the case of the nest built on a pendent chain (George, 1957) about 13 cm. of the latter was built into the nest. Another nest was loosely attached throughout its whole length to a vertical stem of a climber.

The next development in nest construction was to poke the nest stalk with the beak at a point about 3 cm. to 7 cm. below the point of suspension. The poking was done during several visits to the nest, but usually only once per visit. Occasionally, material brought to the nest was pushed in at this point with a vigorous thrust. In one nest the fibres around this point showed a circular orientation by 11 a.m.; in some other nests orientation was visible by the evening; in yet others, especially where leaves were used in abundance, no orientation was observed. At the end of the first day the nest stalks were found to be from 5 cm. to 15 cm. in length with a tail up to 15 cm. in length. The stalk was often shaped like a gently tapering cone with the apex at the top.

Second day's work: On the second day more material was added to the nest stalk. Poking was continued, but the head itself was now pushed into the mass of materials. Eventually a depression appeared at this point if the nest stalk was very bulky or a hole appeared if the nest stalk was fibrous and thin. Starting from the same point, the direction of the push was now changed up to about 75° to the left and right. The material at the back of the stalk got spread out and the beak of the bird and, later on, its head came out on the sides and back of the nest. The spreading out of the materials at the back and sides of the nest stalk was the first step in the formation of the pouch. The wall so formed was very flimsy at this stage with a big hole in the middle, opposite the point at which the bird started pushing, and many other smaller holes and gaps. The hole in front at the point of pushing became the entrance hole to the nest.

The addition of material to the nest went on, but much of it was now pushed in through the entrance hole. The bird continued to enter forward into the entrance hole, but it now also pushed upwards with partly lifted wings. It then backed out. The hole was enlarged by this operation. Standing on the lower rim of the opening,

the bird also pushed up the top rim with its crown. As a result of these pushing operations the hole assumed an oval shape and was larger than the entrance hole of the finished nest in length. When the bird pushed up with partly opened wings, it stretched its legs apart on the lower rim. The whole mouth of the nest was in tension during this operation and elongation of the hole took place both upwards and downwards.

The pushing in of material into the hole continued and the material was further pushed back by the head as described earlier. The wall of the nest got strengthened and the hole at the back was nearly closed in some nests. At this stage the bird carried out a very interesting operation to smoothen the sides of the entrance hole. It lifted its hind parts up to one side and pressed the material on that side of the opening with its tail, using the underside of the tail for the purpose. The operation was carried out on both sides, now on one side, now on the other. The tail was sometimes lifted well above the head for this operation.

A move to force down the bottom of the nest to enlarge and lengthen it into a pouch also began at this stage. The bird entered the nest and with a vigorous shaking movement of its body, sank into the material at the bottom.

Another interesting move was made to smoothen the lower rim of the entrance hole. The bird entered the nest, turned about and put its head outside the nest. The head was then bobbed up and down so that the throat pressed the rim. The bird moved left and right to cover the whole rim. If some point of the rim was misshapen this head bobbing was sometimes restricted to that point only.

Third day's work: On the third day the bird continued to push the top of the opening with its crown and partly lifted wings. Pressing the rim of the opening with the tail and throat, and forcing the bottom down to lengthen the pouch were also continued. In those nests where the back wall of the nest was slow to form, these operations were begun only on the third day.

The construction of the cornice and the lining of the pouch were taken in hand on the third day. The former was completed on the fourth day, while the latter was continued till the bird was ready to lay. Most of the lining work was, however, done on the third and fourth days.

A move to consolidate the materials of the wall and to bulge it out further was begun on the third day and continued on subsequent days. The bird entered the nest, remained inside in various directions and pushed the wall backwards with the underside of its tail. The

point that was pushed could be seen shaking and bulging out on the outside. The wall of the nest is very pliable, so that when the bird stopped pushing, the bulge disappeared. The directions in which the bird pushed with its tail were the same as those in which it pushed with its beak and head earlier on the second and third days. In addition, the bird took up positions at right angles to the direction it occupies while incubating and pushed out the wall on the left and right of the entrance hole.

It is interesting to compare these actions of the Purple Sunbird with the corresponding actions of the Yellowbreasted Sunbird (*Nectarinia jugularis*), so vividly described by Loke (1954) who observed the bird at work in his garden in Singapore. Every so often, the female Yellowbreasted Sunbird would sit inside the nest and turn in a circle with the object of rounding out the lower half of the nest chamber. Sometimes she would sit with her beak projecting out of the entrance and with wings slightly opened would move vigorously from side to side pushing out the walls of the nest.

The hole in the back wall sometimes became larger as a result of the tail movements of the Purple Sunbird. Material added subsequently usually closed the hole again.

Very little material was added to the exterior of the nest on the third day. On the fourth day it was done only once or twice. On subsequent days there was no addition at all.

Fourth day's work: Work on the cornice and the lining of the pouch continued on the fourth day. The lining material was smoothed down by the shaking and sinking movement. The wall was pushed on all sides with the tail. The bird also pressed against the sides of the wall with its body. Hume's expression 'trying the fit' may be taken to mean all these operations together.

The wall of the nest sometimes developed holes even on the fourth day when the bird was trying the fit. These holes were usually closed with material added later, but small holes remained in the finished nest sometimes.

The upper end of the oval opening was built over in making the cornice. The sides received on very rare occasions some material to strengthen them. The lower rim became thickened by the material added on the inside of the nest and by the ends of fibres pulled in from the outside of the nest by the bird. The result of all this was that the entrance hole became more or less circular in shape.

Fifth and subsequent days' work: Lining of the nest continued on the fifth day. No other material was added to the pouch but fibres sticking out in front were pulled in through the entrance hole and

the entrance smoothed out by the tail if found necessary. The front side of the nest was sometimes further tidied up by pushing loose projecting ends of fibres into the body of the nest.

A certain amount of work was done on subsequent mornings till the first egg was laid. This consisted in adding more lining material and trying the fit. The first egg was laid on the eighth or ninth morning after commencement of construction. The second egg followed on the next morning and the third egg, if laid, the morning after.

The 'tail' of the nest: The tail seen hanging below many nests was partly built by the bird and partly accidental. Loose strands of cobweb brought by the bird or already existing at the site 'collected' material falling off the nest. The bird sometimes also fixed material quite low down on these strands of web. There appeared to be a tendency for the bird to 'dump' large size material in the tail region. In one instance the tail was contiguous with cobweb already existing below the site so that the tail appeared to have been joined to a bush lower down. However, this connection was not as conspicuous as the one photographed by Bates (1927, 1931). It is interesting to recall Jerdon's (1877) observation of two nests being built at sites where cobweb already existed.

Collecting material for the nest: For gathering cobweb for the nest, the bird was observed to take hold of one strand after another while hovering, and fly off. For bark, the bird alighted on a suitable stem and tore off piece after piece, some pieces dropping off during the process. Most of the material was collected after alighting at suitable places. Sometimes the bird also tried with little success to snap off grass stems, etc., while hovering.

Orientation of nests: At a very early stage in the construction, it became clear that the bird invariably made the approach to the nest from the same direction. This was the direction in which the opening of the nest eventually faced. The bird did all the work on the nest from the entrance hole side. For fixing material at the back, she stretched her body out over the side or even the top of the nest. It may be worthwhile recording that out of 24 nests observed in 1957 and 1958, 13 nests faced west while only 7 faced north and 2 each faced east and south.

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